

Student Activity Guide for NAEP Interactive Science Task: Playground Soil

http://www.nationsreportcard.gov/science_2009/ict_tasks.asp

Select "Take this task" under Playground Soil.



GRADE 4
Cracking Concrete
Predict the effect of the freeze/thaw cycle on a concrete sidewalk.
Duration: 20 minutes
[Take this task >](#)
[Scoring information >](#)



GRADE 4
Here Comes the Sun
Predict path of the sun and number of daylight hours to determine best planting location.
Duration: 20 minutes
[Take this task >](#)
[Scoring information >](#)



GRADE 4
Mystery Plants
Determine optimum amount of light and nutrients for plant growth.
Duration: 40 minutes
[Take this task >](#)
[Scoring information >](#)



GRADE 8
Bottling Honey
Investigate flow rates of four liquids to determine best temperature for bottling honey.
Duration: 20 minutes
[Take this task >](#)
[Scoring information >](#)



GRADE 8
Playground Soil
Investigate attributes of two soil samples to determine the best site for building a playground.
Duration: 20 minutes
[Take this task >](#)
[Scoring information >](#)



GRADE 8
Planning a Park
Evaluate the impact of a planned recreation park on specific organisms.
Duration: 40 minutes
[Take this task >](#)
[Scoring information >](#)



GRADE 12
Energy Transfer
Investigate energy transfer between substances to determine the best metal for a cooking pot.
Duration: 20 minutes
[Take this task >](#)
[Scoring information >](#)



GRADE 12
Starlight
Investigate relationships between the luminosity and temperature of different stars.
Duration: 20 minutes
[Take this task >](#)
[Scoring information >](#)



GRADE 12
Phytoplankton Factor
Investigate ocean conditions that support phytoplankton growth.
Duration: 40 minutes
[Take this task >](#)
[Scoring information >](#)

In this task, you will investigate the permeability of soil samples from two sites a town is considering for a play area. You will use their results to help decide which site has the better water drainage and is therefore the better place for a grassy play area.

Read the information on each screen. Select "NEXT" when you have finished reading the information on the screen.

Site A

Site B

Welcome!

A town is considering two sites for a grassy play area for children.

The soil of the site for the play area needs to have good water drainage so the site does not become too wet and muddy to use at any time of the year.

Click "NEXT" to continue.

BACK NEXT

SOIL SAMPLE A

- 10% clay
- 50% fine gravel
- 40% silt

SOIL SAMPLE B

- 10% clay
- 50% sand
- 40% silt

DEFINITION

In this task, you will investigate the permeability of soil samples from the two sites the town is considering for the play area. This will help you decide which site has better water drainage.

The permeability of a soil is a measure of the rate at which water flows through the soil's pores (empty spaces). In this task, permeability is measured as milliliters of water per minute (mL/min).

You can look at the definition of permeability anytime by clicking "DEFINITION" on the left.

Click "NEXT" to continue.

When there is a question, write your answer on this worksheet, not on the computer screen. If you answer directly on the computer, your answer will not be saved. You do not need to answer anything directly on the computer. After answering, select "NEXT" to continue.

SOIL SAMPLE A

- 10% clay
- 50% fine gravel
- 40% silt

SOIL SAMPLE B

- 10% clay
- 50% sand
- 40% silt

DEFINITION

Click "ZOOM IN" to see microscopic views of the two soil samples.

Based on the composition of soil sample A and soil sample B, which soil do you think will have greater permeability?

A Soil A

B Soil B

Explain why you think so in terms of the characteristics of the soils.

Click "NEXT" to continue. You will not be able to return to this screen once you click on the "NEXT" button.

Question 1

Based on the composition of soil sample A and soil sample B, which soil do you think will have greater permeability?

- A. Soil A
- B. Soil B

Explain why you think so in terms of the characteristics of the soils.

SOIL A

SOIL B

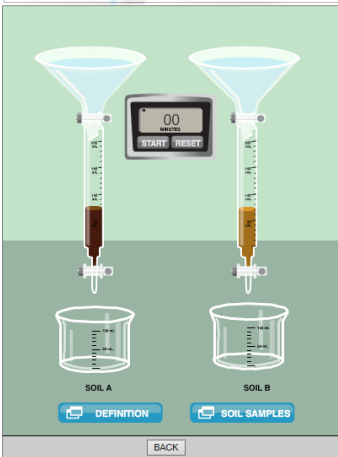
DEFINITION SOIL SAMPLES

Your task is to measure the permeabilities of the soil samples from Site A and Site B, using the simulation on the left.

You can read the definition of permeability and look at the compositions of the soil samples using the buttons on the left.

The soil samples have already been saturated. This means that the pores (empty spaces) in the soil are already filled with water.

Click "NEXT" to continue.



Now you will use the simulation to investigate the permeability of each soil sample. Time in the simulation is speeded up.

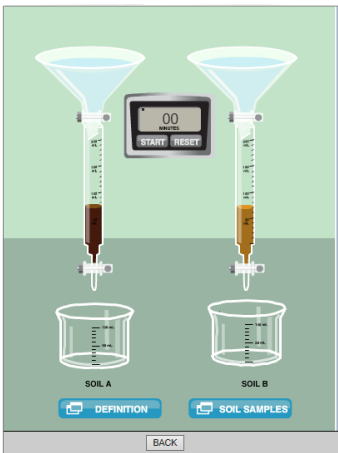
Click "START" to start the timer and open the water flow into both samples.

You may click "RESET" to go back to the beginning of the simulation.

Observe as the water flows through the soil samples.

After the water has run for 30 minutes, the simulation will stop.

Click "NEXT" to continue.



Describe what data should be collected to calculate the permeability of each soil sample.

Explain how to use these data to calculate the permeability of each soil.

Click "NEXT" to continue. You will not be able to return to this screen once you click on the "NEXT" button.

Question Two

Describe what data should be collected to calculate the permeability of each soil sample.

Explain how to use these data to calculate the permeability of each soil.

For each soil sample, record the volume of water that has flowed into each beaker.

Click "ZOOM IN" to read the scale on the beakers.

Soil A: water volume (mL)

Soil B: water volume (mL)

Calculate the permeability for each soil sample in milliliters per minute. Round your answers to the nearest tenth.

Soil A: water permeability (mL/min)

Soil B: water permeability (mL/min)

Click "NEXT" to continue. You will not be able to return to this screen once you click on the "NEXT" button.

Question Three

For each soil sample, record the volume of water that has flowed into each beaker.

Click "ZOOM IN" to read the scale on the beakers.

Soil A: water volume (mL)

Soil B: water volume (mL)


Question Four

Calculate the permeability for each soil sample in milliliters per minute. Round answers to the nearest tenth.


Soil A: water permeability (mL/min)

Soil B: water permeability (mL/min)

Site A



Site B



SOIL SAMPLES

BACK

DONE

The soil of the site for the play area needs to have good water drainage so that it does not become too wet and muddy to use at any time of the year.

Another student repeated the experiments you just ran to calculate the permeabilities of the two soils.

The student's results are shown below.

Soil A at Site A
Permeability: 3.0 mL/min

Soil B at Site B
Permeability: 0.3 mL/min

Based on these data, which soil would be best to use for the play area?

A Soil A
 B Soil B

Explain how you know. Use the data to support your explanation.

Question Five

The student's results are shown below.

Soil A at Site A
Permeability: 3.0 mL/min

Soil B at Site B
Permeability: 0.3 mL/min

Based on these data, which soil would be best to use for the play area?

- A. Soil A
- B. Soil B

Explain how you know. Use the data to support your explanation.
